

# Business Trends and Outlook Survey Methodology

Version 3

Last Updated: Tuesday, October 4, 2022

## Target Population

The initial target population for BTOS is all nonfarm, single-location employer businesses with receipts of \$1,000 or more that are in the United States, District of Columbia, and Puerto Rico. The following industries were designated as out of scope for the BTOS:

- Agriculture production (NAICS in ('110000', '111', '112'))
- Railroads (NAICS = '482')
- U.S. Postal Service (NAICS = '491')
- Monetary Authorities – Central Bank (NAICS = '521')
- Funds, Trusts, and other financial vehicles (NAICS = '525')
- Religious grant operations and religious organizations (NAICS = '813')
- Private households (NAICS = '814')
- Public administration (NAICS = '92')
- Unclassified with legal form of organization as tax-exempt or unknown

Businesses classified without a 2-digit NAICS (NAICS = '00') were not included.

## Sampling Frame

The sampling frame consists of establishments on the 2020 Business Register that are in the target population. The October 2021 monthly Business Register and the 2021 Annual Business Survey Out-of-Scope File are used to remove out-of-scope and out-of-business establishments from the frame.

## Sample Design

### Sample Allocation

Proportional sample allocation is used (the same percentage of businesses is selected from each stratum).

### Sampling Strata

In general, the sampling strata are defined by sector (two-digit NAICS) by state. The following sampling strata are each a single stratum that includes businesses from all fifty states, Washington, D.C., and Puerto Rico to ensure adequate sample size: Sectors 11, 21, 22, and 55. Before selecting the sample, the sampling frame is sorted by MSA and annual payroll within each stratum.

## Sample Size

Every year, a sample of approximately 1.2 million businesses is selected. The sample is sorted by sector x state x MSA x annual payroll and then each sampled business is systematically assigned to one of six biweekly panels (this creates panels that are about the same size and have similar industry x geography distributions), so the survey is sent out to approximately 200,000 businesses every two weeks.

## Frequency of Data Collection

Once in the sample, businesses are asked to respond to the survey once every twelve weeks (e.g., a business that is contacted to respond in Weeks 1-2 will also be contacted to respond in Weeks 13-14, Weeks 25-26, etc.).

## Time-In Requirement

The same sample of 1.2 million businesses is used for one year and then replaced with a new sample of 1.2 million businesses. This means that each business is asked to respond up to five times over a period of one year before going out of sample.

## Time-Out Requirement

Once businesses have completed their time-in requirement, they stay out of sample for at least one year.

## Sample Maintenance

Once a sample is selected, no quarterly sample maintenance is done except for removing from the remaining week's collections businesses that respond as out of business. The entire sample is replaced after one year.

## Type of Request

The BTOS is a voluntary survey.

## Questionnaire Content

The questionnaire for the BTOS contains 26 questions. The respondents are asked to report for the previous two weeks and looking forward six-months on concepts such as performance, employment, hiring difficulties, and supply chain delays.

## Mode of Contact

The first time each biweekly panel is in sample, businesses are contacted either by email or letter with an invitation to respond to the survey. For each biweekly survey panel, initial letters are sent on the Friday before the two-week period while initial emails are sent on the first Monday of the two-week period. Starting with the second time each biweekly panel is in sample, businesses are contacted only by email with an invitation to respond to the survey. Both letter and email invitations describe the purpose of the survey collection, include the link to the online reporting tool, and contain the access code.

## Response Criteria

The response period for each biweekly tabulation closes at 11:59pm on Sundays. Businesses that submit responses after their assigned panel closes are deemed late responses and not tabulated.

To be considered a respondent to the BTOS, a business must respond to at least one of the survey questions. The online instrument was designed to encourage response to every question. If a survey participant attempts to move past a particular question without providing a response, a warning box appears to prompt the respondent to provide a response. The respondent is permitted to move to the next question without responding on the next attempt.

The Unit Response Rate (URR) is calculated biweekly as:

$$\text{Unit response rate} = 100 * (R) / (R + NR)$$

where

- R is the number of respondents in the current biweekly panel
- NR is the number of non-respondents in the current biweekly panel

The published values of R and URR are rounded for disclosure protection. See the Disclosure Avoidance section below and Legacy Techniques and Current Research on Disclosure Avoidance for a description of the rounding procedures used for frequency counts and related characteristics.

## Compilation of Data

### Editing

Due to the nature of the survey questions and rapid cycle of data collection and release, the BTOS response data is not subjected to editing.

### Nonresponse

Nonresponse is defined as the inability to obtain requested data from an eligible survey unit. Two types of nonresponse are often distinguished. Unit nonresponse is the inability to obtain any of the substantive measurements about a unit. In most cases of unit nonresponse, the Census Bureau was unable to obtain any information from the survey unit after several attempts to elicit a response. Item nonresponse occurs when a particular question is unanswered.

### Nonresponse Adjustment

The BTOS nonresponse adjustment consists of two weighting class adjustment factors: NAF1 and NAF2. NAF1 uses adjustment cells defined by state and employment size class (EMPSIZE). EMPSIZE is a categorical version of the number of employees in the establishment and has three categories: four or fewer employees ('A'), between 5 and 19 employees ('B'), and 20 or more employees ('C'). NAF2 uses adjustment cells defined by 2-digit NAICS (sector) and EMPSIZE.

The purpose of the nonresponse adjustment is to account for potential nonresponse bias related to state, sector, and EMPSIZE. Theoretically, this could be done with a single weighting class adjustment with cells defined by state, sector, and EMPSIZE. However, in practice, if a single factor defined by these

three variables was used, then many cells would be very small (less than ten respondents), so the adjustment factors would be unstable and could lead to undesirable increases in estimate variances. Using NAF1 x NAF2 as the nonresponse adjustment accounts for potential nonresponse bias related to these three variables and lowers the risk of large increases in estimate variances related to the nonresponse adjustment compared to using a single weighting class nonresponse adjustment with cells defined by state, sector, and EMPSIZE. However, NAF1 x NAF2 does not account for potential nonresponse bias related to the two-way interaction between state and sector or the three-way interaction between state, sector, and EMPSIZE.

NAF1 is computed in the following manner: Within each state by EMPSIZE adjustment cell, NAF1 is equal to the sum of the sample weights for the respondents and nonrespondents that were sampled in the current biweekly panel divided by the sum of the sample weights for the respondents that were sampled in the current biweekly panel. NAF1 is used to create an intermediate weight, NAF1\_WGT, that is equal to the product of the sample weight and NAF1. NAF1\_WGT will be used to compute NAF2.

After computing NAF1, NAF2 is computed in the following manner: Within each sector by EMPSIZE adjustment cell, NAF2 is equal to the sum of the sample weights for the respondents and nonrespondents that were sampled in the current biweekly panel divided by the sum of NAF1\_WGT for the respondents that were sampled in the current biweekly panel. The final nonresponse-adjusted weight is set equal to the product of NAF1\_WGT and NAF2. This is also equal to the product of the sample weight, NAF1, and NAF2.

For both NAF1 and NAF2, small adjustment cells are collapsed together. Within a state (NAF1) or within a sector (NAF2), the EMPSIZE cells are collapsed in the following manner:

- 1) If all three EMPSIZE cells have at least ten respondents, then no collapsing is done.
- 2) Otherwise, if either the EMPSIZE = 'B' or EMPSIZE = 'C' cell has fewer than ten respondents, the EMPSIZE = 'A' cell has at least ten respondents, and the EMPSIZE = 'B' and 'C' cells combined have at least ten respondents, then the EMPSIZE = 'B' and 'C' cells are collapsed together and the EMPSIZE = 'A' cell is not collapsed.
- 3) Otherwise, if either the EMPSIZE = 'A' or EMPSIZE = 'B' cell has fewer than ten respondents, the EMPSIZE = 'C' cell has at least ten respondents, and the EMPSIZE = 'A' and 'B' cells combined have at least ten respondents, then the EMPSIZE = 'A' and 'B' cells are collapsed together and the EMPSIZE = 'C' cell is not collapsed.
- 4) Otherwise, all three EMPSIZE cells within the state (NAF1) or sector (NAF2) are collapsed together.

States are not collapsed together for NAF1 and sectors are not collapsed together for NAF2. It is assumed that all states and sectors have at least ten respondents.

## Estimation

For each question on the survey, the published percentage estimate for a particular response category is calculated as the sum of the nonresponse-adjusted weights for all responses in that particular response category, divided by the sum of the nonresponse-adjusted weights for each business responding to the question.

The survey also publishes indexes. Each index is based on the responses for a single question and equals a weighted average of the proportion estimates for that question (the proportion estimate is the percentage estimate converted to a 0 to 1 scale). Indexes are based on questions with two possible sets of response choices: 1) “Excellent,” “Above average,” “Average,” “Below average,” and “Poor,” or 2) “Increased,” “No Change,” and “Decreased.”

For questions with the first set of response choices, the index estimate for Question  $i$  equals  $\hat{I}_i = 100 * (1 * \hat{P}_{E,i} + 0.75 * \hat{P}_{AA,i} + 0.5 * \hat{P}_{A,i} + 0.25 * \hat{P}_{BA,i} + 0 * \hat{P}_{P,i})$ , where  $\hat{P}_{E,i}$  is the proportion estimate for response choice “Excellent” for Question  $i$ ,  $\hat{P}_{AA,i}$  is the proportion estimate for response choice “Above average” for Question  $i$ ,  $\hat{P}_{A,i}$  is the proportion estimate for response choice “Average” for Question  $i$ ,  $\hat{P}_{BA,i}$  is the proportion estimate for response choice “Below average” for Question  $i$ , and  $\hat{P}_{P,i}$  is the proportion estimate for response choice “Poor” for Question  $i$ .

For questions with the second set of response choices, the index estimate for Question  $i$  equals  $\hat{I}_i = 100 * (1 * \hat{P}_{I,i} + 0.5 * \hat{P}_{NC,i} + 0 * \hat{P}_{D,i})$ , where  $\hat{P}_{I,i}$  is the proportion estimate for response choice “Increased” for Question  $i$ ,  $\hat{P}_{NC,i}$  is the proportion estimate for response choice “No change” for Question  $i$ , and  $\hat{P}_{D,i}$  is the proportion estimate for response choice “Decreased” for Question  $i$ .

### Sampling Error

The sampling error of an estimate based on a sample survey is the difference between the estimate and the result that would be obtained from a complete census conducted under the same survey conditions. This error occurs because characteristics differ among sampling units in the population and only a subset of the population is measured in a sample survey. Sampling weights are used to ensure that the sample represents the entire in-scope population. The use of sampling weights also allows for the estimation of sampling variability of the survey estimates.

A common measure of sampling variability for percentage estimates is the standard error of the estimate. The standard error is the square root of the sampling variance, which is the squared difference, averaged over all possible samples of the same size and design, between the estimator and its average value. The standard errors for the BTOS estimates are calculated using a delete-a-group jackknife procedure, using 10 groups.

It is important to note that the sampling variance and standard error only measure sampling variability. They do not measure any systematic biases in the estimates.

The Census Bureau recommends that individuals using these estimates incorporate sampling error information into their analyses, as this could affect the conclusions drawn from the estimates.

### Confidence Intervals

The sample estimate and an estimate of its standard error allow us to construct interval estimates with prescribed confidence that the interval includes the average result of all possible samples with the same size and design. To illustrate, if all possible samples were surveyed under essentially the same conditions, and an estimate and its standard error were calculated from each sample, then:

Approximately 68 percent of the intervals from one standard error below the estimate to one standard error above the estimate would include the average estimate derived from all possible samples.

Approximately 90 percent of the intervals from 1.645 standard errors below the estimate to 1.645 standard errors above the estimate would include the average estimate derived from all possible samples.

In the example above, the margin of error (MOE) associated with the 90 percent confidence interval is the product of 1.645 and the estimated standard error.

For example, suppose that a domain had an estimated percentage of 50% (.50) in one response category and that the standard error of this estimate was 0.005. A 68 percent confidence interval for this estimate is 0.495 to 0.505, and a 90-percent confidence interval is 0.492 to 0.508 (0.500 plus or minus 1.645 times 0.005).

### Nonsampling Error

Nonsampling error encompasses all factors other than sampling error that contribute to the total error associated with an estimate. This error may also be present in censuses and other nonsurvey programs. Nonsampling error arises from many sources: inability to obtain information on all units in the sample; response errors; differences in the interpretation of the questions; mismatches between sampling units and reporting units, requested data and data available or accessible in respondents' records, or with regard to reference periods; mistakes in coding or keying the data obtained; and other errors of collection, response, coverage, and processing.

Although no direct measurement of nonsampling error is obtained, precautionary steps are taken in the collection, processing, and tabulation of the data in an effort to minimize its influence. Precise estimation of the magnitude of nonsampling errors would require special experiments or access to independent data and, consequently, the magnitudes are often unavailable.

The Census Bureau recommends that individuals using these estimates factor in this information when assessing their analyses of these data, as nonsampling error could affect the conclusions drawn from the estimates.

Refer to the response criteria section above for how the unit response rate (URR) is calculated for each biweekly panel of the BTOS as an indicator of potential nonsampling error. Businesses are assumed to be active and in-scope, including cases with unsuccessful delivery of emails or letters, in the absence of evidence otherwise.

### Disclosure Avoidance

Disclosure is the release of data that reveals information or permits deduction of information about a particular survey unit through the release of either tables or microdata. Disclosure avoidance is the process used to protect each survey unit's identity and data from disclosure. Using disclosure avoidance procedures, the Census Bureau modifies or removes the characteristics that put information at risk of disclosure. Although it may appear that a table shows information about a specific survey unit, the

Census Bureau has taken steps to disguise or suppress a unit's data that may be "at risk" of disclosure while making sure the results are still useful.

Additionally, BTOS suppresses estimates with relative standard errors greater than 50%. The relative standard error of an estimate is equal to the standard error of the estimate divided by the estimate.

In certain circumstances, some individual cells may be suppressed for additional disclosure avoidance. Suppressed data are replaced by the following symbol:

S - Estimate does not meet publication standards because of high sampling variability, poor response quality, or other concerns about the estimate quality. Unpublished estimates derived by subtraction are subject to these same limitations and should not be attributed to the U.S. Census Bureau.

The Census Bureau has reviewed the data product for unauthorized disclosure of confidential information and has approved the disclosure avoidance practices applied. (Approval ID: CBDRB-FY22-341)